FIG.1

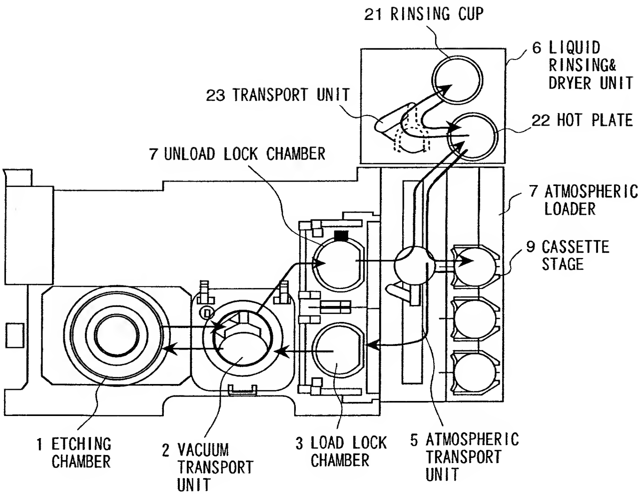


FIG.2

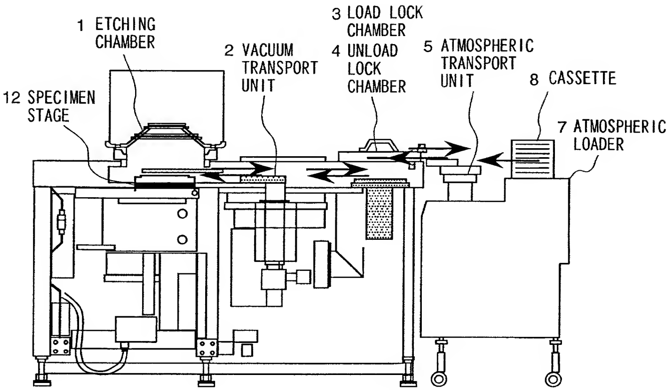


FIG.3

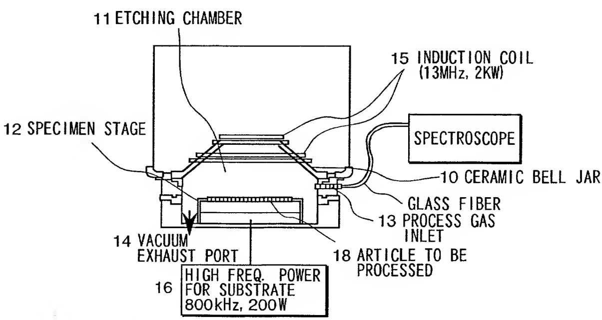


FIG.4

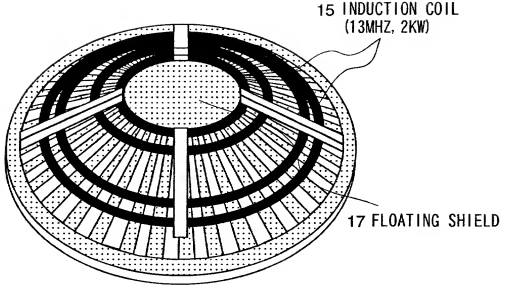

15 INDUCTION COIL
(13MHZ, 2KW)
17 FLOATING SHIELD

FIG.5

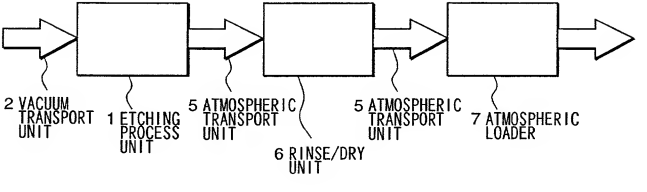

2 VACUUM TRANSPORT UNIT
1 ETCHING PROCESS UNIT
5 ATMOSPHERIC TRANSPORT UNIT
6 RINSE/DRY UNIT
5 ATMOSPHERIC TRANSPORT UNIT
7 ATMOSPHERIC LOADER

FIG.6

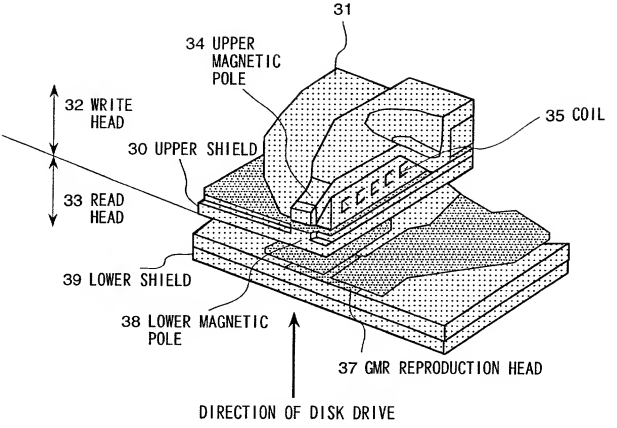
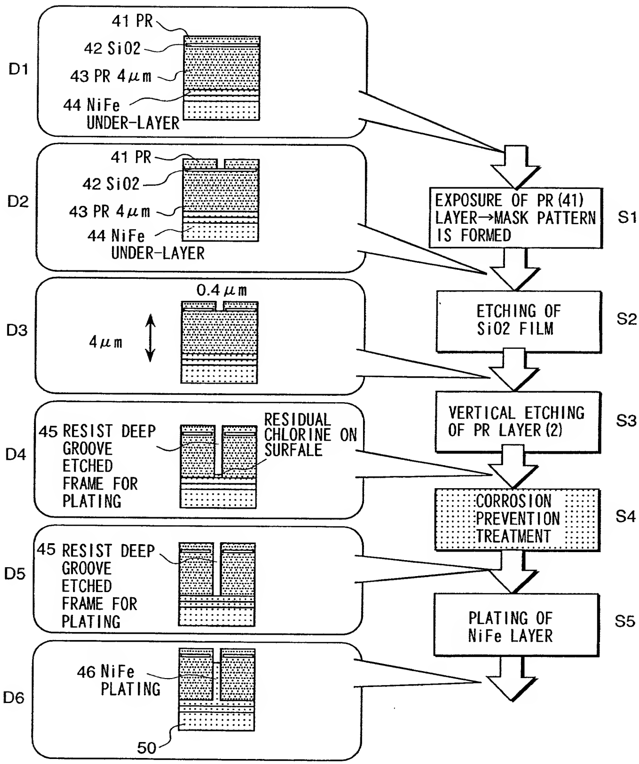


FIG.7



D1
41 PR
42 Si02
43 PR 4μm
44 NiFe UNDER-LAYER
D2
41 PR
42 Si02
43 PR 4μm
44 NiFe UNDER-LAYER
D3
0.4μm
4μm
D4
45 RESIST DEEP GROOVE ETCHED FRAME FOR PLATING
RESIDUAL CHLORINE ON SURFALE
D5
45 RESIST DEEP GROOVE ETCHED FRAME FOR PLATING
D6
46 NiFe PLATING
50
EXPOSURE OF PR (41) LAYER→MASK PATTERN IS FORMED
S1
ETCHING OF Si02 FILM
S2
VERTICAL ETCHING OF PR LAYER (2)
S3
CORROSION PREVENTION TREATMENT
S4
PLATING OF NiFe LAYER
S5

FIG.8

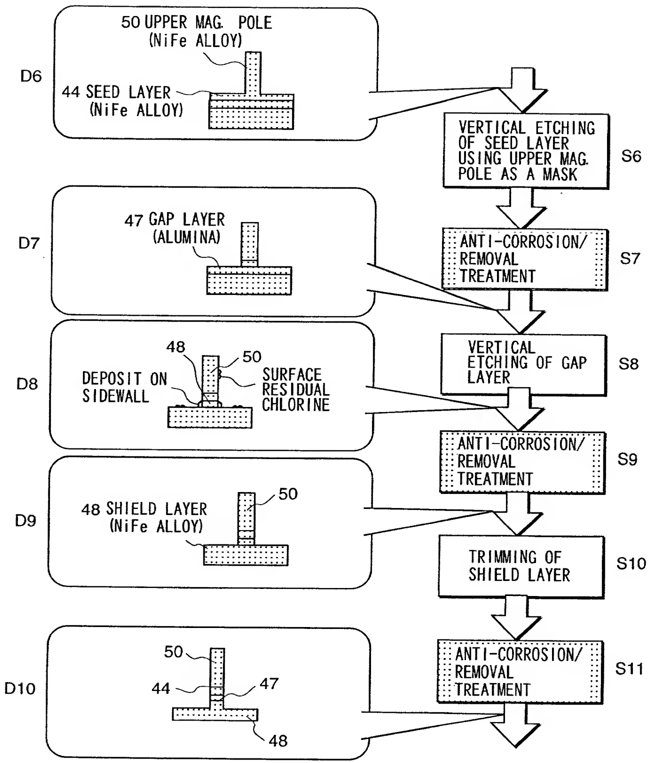

D6
50 UPPER MAG. POLE
(NiFe ALLOY)
44 SEED LAYER
(NiFe ALLOY)
VERTICAL ETCHING OF SEED LAYER USING UPPER MAG. POLE AS A MASK
S6
D7
47 GAP LAYER
(ALUMINA)
ANTI-CORROSION/ REMOVAL TREATMENT
S7
D8
48
50
DEPOSIT ON SIDEWALL
SURFACE RESIDUAL CHLORINE
VERTICAL ETCHING OF GAP LAYER
S8
ANTI-CORROSION/ REMOVAL TREATMENT
S9
D9
48 SHIELD LAYER
(NiFe ALLOY)
50
TRIMMING OF SHIELD LAYER
S10
D10
50
44
47
48
ANTI-CORROSION/ REMOVAL TREATMENT
S11

FIG. 9

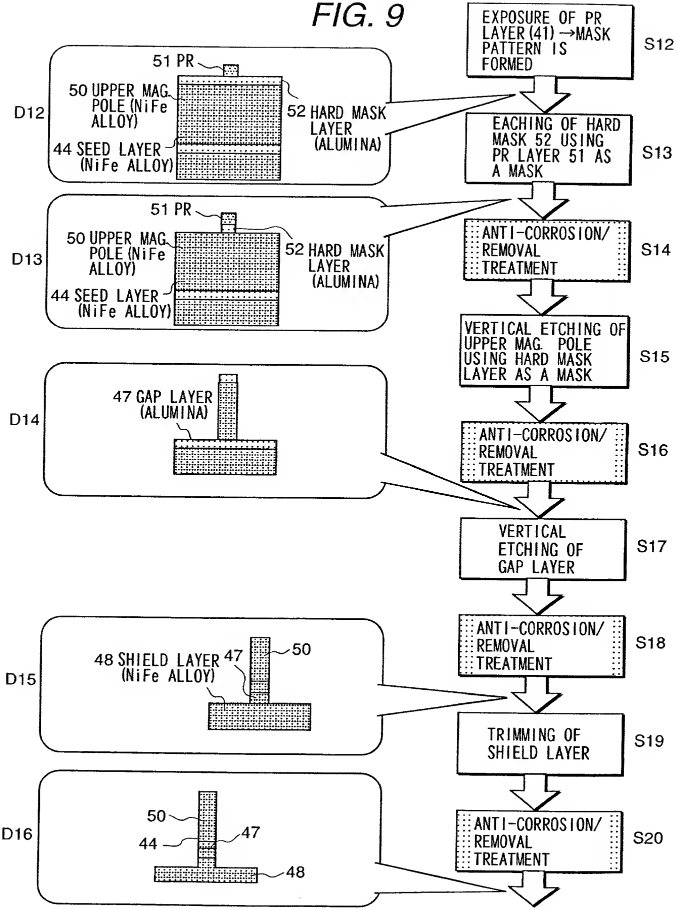

EXPOSURE OF PR LAYER (41) →MASK PATTERN IS FORMED
S12
EACHING OF HARD MASK 52 USING PR LAYER 51 AS A MASK
S13
ANTI-CORROSION/ REMOVAL TREATMENT
S14
VERTICAL ETCHING OF UPPER MAG. POLE USING HARD MASK LAYER AS A MASK
S15
ANTI-CORROSION/ REMOVAL TREATMENT
S16
VERTICAL ETCHING OF GAP LAYER
S17
ANTI-CORROSION/ REMOVAL TREATMENT
S18
TRIMMING OF SHIELD LAYER
S19
ANTI-CORROSION/ REMOVAL TREATMENT
S20
D12
51 PR
50 UPPER MAG. POLE (NiFe ALLOY)
52 HARD MASK LAYER (ALUMINA)
44 SEED LAYER (NiFe ALLOY)
D13
51 PR
50 UPPER MAG. POLE (NiFe ALLOY)
52 HARD MASK LAYER (ALUMINA)
44 SEED LAYER (NiFe ALLOY)
D14
47 GAP LAYER (ALUMINA)
D15
48 SHIELD LAYER (NiFe ALLOY)
47
50
D16
50
44
47
48

FIG.10

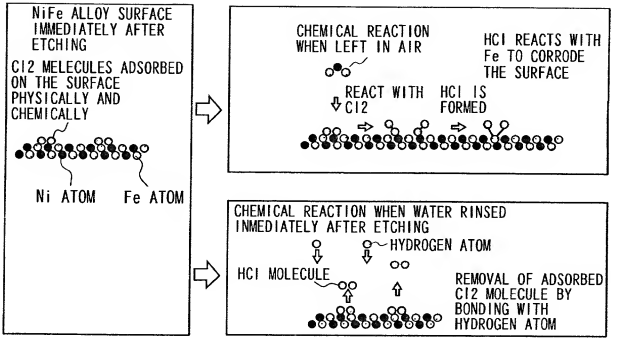

NiFe ALLOY SURFACE IMMEDIATELY AFTER ETCHING
Cl2 MELECULES ADSORBED ON THE SURFACE PHYSICALLY AND CHEMICALLY
Ni ATOM
Fe ATOM
CHEMICAL REACTION WHEN LEFT IN AIR
HCl REACTS WITH Fe TO CORRODE THE SURFACE
REACT WITH Cl2
HCl IS FORMED
CHEMICAL REACTION WHEN WATER RINSED INMEDIATELY AFTER ETCHING
HYDROGEN ATOM
HCl MOLECULE
REMOVAL OF ADSORBED Cl2 MOLECULE BY BONDING WITH HYDROGEN ATOM

FIG.12

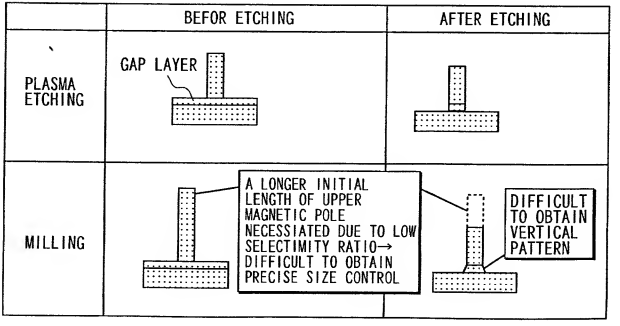
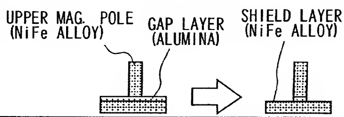

BEFOR ETCHING
AFTER ETCHING
PLASMA ETCHING
GAP LAYER
MILLING
A LONGER INITIAL LENGTH OF UPPER MAGNETIC POLE NECESSIATED DUE TO LOW SELECTIMITY RATIO→ DIFFICULT TO OBTAIN PRECISE SIZE CONTROL
DIFFICULT TO OBTAIN VERTICAL PATTERN

FIG.11

EXPERIMENTAL CONDITIONS*	TIME UNTIL CORROSION OCCURS
LEFT IN AIR AFTER ETCHING OF GAP LAYER	5 MIN.
LEFT IN AIR AFTER PURE WATER RINSING/DRYING WITHIN 2 MIN. AFTER ETCHING OF GAP LAYER	AFTER MORE THAN 2 WEEKS

ITEM	UNIT	RESULT
RATE	nm/min	108.5

*OTHER CONDITIONS

ITEM	CONDITIONS
DEVICE STRUCTURES PRIOR TO & AFTER ETCHING	
GAS	Cl 20sccm+BCl_3 30sccm
PRESSURE	0.3Pa
STAGE TEMP.	40℃
SOURCE RF POWER	750W
SOURCE RF FREQ.	13.56MHz
BIAS RF POWER	60W
BIAS RF FREQ.	800KHz